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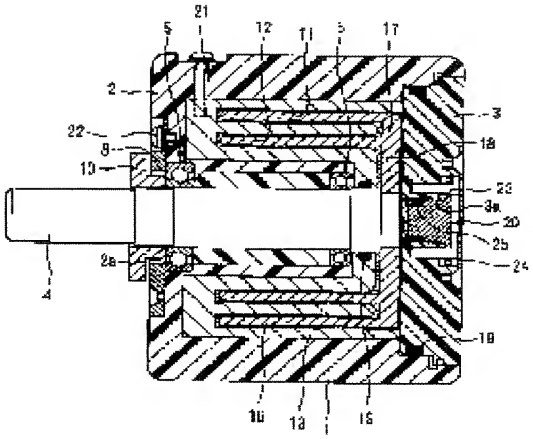
(71)Applicant : ASAHI KASEI CORP
(72)Inventor : INOUE AKIO
NISHIMURA SHOJI

(54) LIQUID FILLING AND SEALING-UP VESSEL

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent liquid filled from being spilled from the sealing-up part and also to prevent outer air from getting inside through the sealed part of a vessel filled with the liquid.
SOLUTION: This relates to a liquid filling and sealing vessel 1 in which liquid 18 is filled and whose opening 3a is closed with a cap 20. The cap 20 is made movable in an axial direction according to the inner pressure change of the container 1.



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CLAIMS

[Claim(s)]
[Claim 1] The liquid restoration well-closed container characterized by opening constituting said lock out member possible [displacement] according to change of internal pressure in the liquid restoration well-closed container sealed by the lock out member while the interior was filled up with the liquid.
[Claim 2] The liquid restoration well-closed container according to claim 1 characterized by being a lid with said deformable lock out member.
[Claim 3] The liquid restoration well-closed container according to claim 2 characterized by said lid being diaphram.
[Claim 4] The liquid restoration well-closed container according to claim 1 with which said lock out member is characterized by being a movable plug in accordance with the opening wall of opening.
[Claim 5] The liquid restoration well-closed container according to claim 4 characterized by said plug touching through said opening wall and rubber, or an elastomer.
[Claim 6] A liquid restoration well-closed container given in any 1 term of claims 1-5 characterized by the liquid with which it filled up not touching air.
[Claim 7] A liquid restoration well-closed container given in any 1 term of claims 1-6 characterized by using the functional fluid from which viscosity changes with external stimuli as said liquid.
[Claim 8] The liquid restoration well-closed container according to claim 7 characterized by said external stimulus being impression of electric field and/or a magnetic field.
[Claim 9] The liquid restoration well-closed container according to claim 7 or 8 characterized by giving damping force to the body of revolution arranged inside using a viscous change of said functional fluid.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the liquid restoration well-closed container with which opening was sealed by the lock out member while the interior is filled up with a liquid.
[0002]
[Description of the Prior Art] If the coefficients of cubical expansion of the liquid with which it filled up, and the ingredient of a well-closed container differ when the well-closed container which has rigidity comparatively is filled up with a liquid to the limit A liquid begins to leak from a sealing part, or the amount of cubical expansion of a liquid exceeds the amount of cubical expansion of a container by the surrounding temperature change, the internal pressure in a container rises, the amount of volumetric shrinkages of a liquid exceeds the amount of volumetric shrinkages of a container, the internal pressure of a container decreases, and the problem of drawing the open air in this container arises.
[0003] From such a situation, it usually left air (gas) ****** which has compressibility in a well-closed container in the former, and has coped with it being filled up with a liquid, using elongation and a cone ingredient for the material of a well-closed container comparatively, or connecting another container for internal pressure adjustment with a well-closed container etc.
[0004]
[Problem(s) to be Solved by the Invention] However, when it leaves an accumulator ball and is filled up with a liquid in a container, if air (gas) is contacted, the engine performance is unsuitable for the liquid deteriorated or solidified. The liquid mainly used as an electric ingredient as an example of such a liquid is mentioned, and if air mixes in a container, it will lifting-come to be easy of dielectric breakdown and electrode corrosion. Especially in the case of the clutch and brake using an electroviscous fluid, if an electrical potential difference is impressed to each inter-electrode one after air has mixed in a container since it is stored in the well-closed container with which the electrode whose electroviscous fluid is positive/negative was prepared, dielectric breakdown will be produced easily.
[0005] Moreover, when precise dimensional accuracy is required when elongation and a cone ingredient are used as a material of a well-closed container, or it is unsuitable for the well-closed container with which deformation is disliked and connects the container for internal pressure adjustment with a well-closed container separately further, the problem that the tooth space which the whole container occupies becomes large occurs. This invention is made in order to cancel such un-arranging, and it aims at offering the liquid restoration well-closed container which can prevent both invasion of the open air to the leakage and the interior from the sealing part of the liquid with which it filled up to a surrounding temperature change.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the liquid restoration well-closed container concerning claim 1 is characterized by constituting said lock out member possible [displacement] according to change of internal pressure in the liquid restoration well-closed container with which opening was sealed by the lock out member while the interior is filled up with a liquid. The liquid restoration well-closed container concerning claim 2 is characterized by being a lid with said deformable lock out member in claim 1.
[0007] The liquid restoration well-closed container concerning claim 3 is characterized by said lid being a diaphragm in claim 2. Said lock out member is characterized by the liquid restoration well-closed container concerning claim 4 being a movable plug in accordance with the opening wall of opening in claim 1. The liquid restoration well-closed container concerning claim 5 is characterized by said plug touching through said opening wall and rubber, or an elastomer in claim 4.

[0008] The liquid restoration well-closed container concerning claim 6 is characterized by the liquid with which it filled up not touching air in any 1 term of claims 1-5. The liquid restoration well-closed container concerning claim 7 is characterized by using the functional fluid from which viscosity changes with external stimuli as said liquid in any 1 term of claims 1-6.
[0009] The liquid restoration well-closed container concerning claim 8 is characterized by said external stimulus being impression of electric field and/or a magnetic field in claim 7. The liquid restoration well-closed container concerning claim 9 is characterized by giving damping force to the body of revolution arranged inside using a viscous change of said functional fluid in claim 7 or 8.
[0010] Here, a coefficient of cubical expansion pulls a liquid restoration well-closed container or less by 5x10 to five, 1% / kg/cm-2 less or equal has the upright number of ductility, an ingredient with little elongation is used, and, specifically, these complex, such as a metal, resin, and ceramics, is mentioned. The thing of the shape of the grease which does not flow unless it applies the external force else [, such as water and an oil,] which flows freely, or a cream can be used for a liquid.
[0011] A lock out member is a means to adjust the internal pressure of the well-closed container which changes according to the volume change of the liquid with which it filled up, and plays the role which prevents a liquid spill and open air invasion. It is possible to use a flexible and deformable diaphragm, a sheet, bellows, etc. as a lid, for example. The electroviscous fluid (electrorheological fluid) which a rheology-property, for example, viscosity and elasticity, changes with external stimuli of electric field, a magnetic field, etc. a lot, and a functional fluid means a thing with the momentarily reversible change, for example, changes with electric fields, the magnetic-viscosity fluid (MR fluid) which changes with magnetic fields, the electric magnetic-viscosity fluid (EMR fluid) which answers electric field and a magnetic field and changes are mentioned.
[0012]
[Embodiment of the Invention] Hereafter, an example of the gestalt of operation of this invention is explained with reference to drawing. The sectional view in which an explanatory sectional view for drawing 1 to explain the brake gear using the electroviscous fluid which is an example of the gestalt of operation of this invention, and drawing 2 show the modification of the attachment section of a plug, drawing 3 , and

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the liquid restoration well-closed container with which opening was sealed by the lock out member while the interior is filled up with a liquid.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] If the coefficients of cubical expansion of the liquid with which it filled up, and the ingredient of a well-closed container differ when the well-closed container which has rigidity comparatively is filled up with a liquid to the limit A liquid begins to leak from a sealing part, or the amount of cubical expansion of a liquid exceeds the amount of cubical expansion of a container by the surrounding temperature change, the internal pressure in a container rises, the amount of volumetric shrinkages of a liquid exceeds the amount of volumetric shrinkages of a container, the internal pressure of a container decreases, and the problem of drawing the open air in this container arises.
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[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, when it leaves an accumulator ball and is filled up with a liquid in a container, if air (gas) is contacted, the engine performance is unsuitable for the liquid deteriorated or solidified. The liquid mainly used as an electric ingredient as an example of such a liquid is mentioned, and if air mixes in a container, it will lifting-come to be easy of dielectric breakdown and electrode corrosion. Especially in the case of the clutch and brake using an electroviscous fluid, if an electrical potential difference is impressed to each inter-electrode one after air has mixed in a container since it is stored in the well-closed container with which the electrode whose electroviscous fluid is positive/negative was prepared, dielectric breakdown will be produced easily.
[0005] Moreover, when precise dimensional accuracy is required when elongation and a cone ingredient are used as a material of a well-closed container, or it is unsuitable for the well-closed container with which deformation is disliked and connects the container for internal pressure adjustment with a well-closed container separately further, the problem that the tooth space which the whole container occupies becomes large occurs. This invention is made in order to cancel such un-arranging, and it aims at offering the liquid restoration well-closed container which can prevent both invasion of the open air to the leakage and the interior from the sealing part of the liquid with which it filled up to a surrounding temperature change.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the effectiveness that both invasion of the open air to the leakage and the interior from the sealing part of the liquid with which it filled up can be prevented to a surrounding temperature change is acquired so that clearly from the above-mentioned explanation.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the liquid restoration well-closed container concerning claim 1 is characterized by constituting said lock out member possible [displacement] according to change of internal pressure in the liquid restoration well-closed container with which opening was sealed by the lock out member while the interior is filled up with a liquid. The liquid restoration well-closed container concerning claim 2 is characterized by being a lid with said deformable lock out member in claim 1.
[0007] The liquid restoration well-closed container concerning claim 3 is characterized by said lid being a diaphragm in claim 2. Said lock out member is characterized by the liquid restoration well-closed container concerning claim 4 being a movable plug in accordance with the opening wall of opening in claim 1. The liquid restoration well-closed container concerning claim 5 is characterized by said plug touching through said opening wall and rubber, or an elastomer in claim 4.
[0008] The liquid restoration well-closed container concerning claim 6 is characterized by the liquid with which it filled up not touching air in any 1 term of claims 1-5. The liquid restoration well-closed container concerning claim 7 is characterized by using the functional fluid from which viscosity changes with external stimuli as said liquid in any 1 term of claims 1-6.
[0009] The liquid restoration well-closed container concerning claim 8 is characterized by said external stimulus being impression of electric field and/or a magnetic field in claim 7. The liquid restoration well-closed container concerning claim 9 is characterized by giving damping force to the body of revolution arranged inside using a viscous change of said functional fluid in claim 7 or 8.
[0010] Here, a coefficient of cubical expansion pulls a liquid restoration well-closed container or less by 5x10 to five, 1% / kg/cm-2 less or equal has the upright number of ductility, an ingredient with little elongation is used, and, specifically, these complex, such as a metal, resin, and ceramics, is mentioned. The thing of the shape of the grease which does not flow unless it applies the external force else [, such as water and an oil,] which flows freely, or a cream can be used for a liquid.
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[0012]
[Embodiment of the Invention] Hereafter, an example of the gestalt of operation of this invention is explained with reference to drawing. The sectional view in which an explanatory sectional view for drawing 1 to explain the brake gear using the electroviscous fluid which is an example of the gestalt of operation of this invention, and drawing 2 show the modification of the attachment section of a plug, drawing 3 , and drawing 4 are the sectional views showing the example of attachment of diaphram.
[0013] In drawing 1 , a sign 1 is the container made of resin of the shape of a cylinder which has the end plates 2 and 3 made of resin to both ends (right-and-left edge), respectively, and the Rota shaft 4 is supported pivotable through two metal bearing 5 and 6 in this container 1. In drawing, the bearing 5 with larger left-hand side is attached in shaft through tube 2a of the left end plate 2, is pushed on shaft orientations by the outer-ring-of-spiral-wound-gasket presser foot 8 by which the screw stop of the outer ring of spiral wound gasket was carried out to the left end plate 2, and is pushed on shaft orientations by

the inner-ring-of-spiral-wound-gasket presser foot 10 by which the inner ring of spiral wound gasket was screwed in the shaft 4.
[0014] Moreover, in a container 1, the metal fixed electrode 13 which has the duplex cylinder-like slots 11 and 12 is built in, fitting immobilization is carried out and the metal duplex cylinder electrode (body of revolution) 16 inserted in the Rota shaft 4 through a predetermined gap in the slots 11 and 12 of a fixed electrode 13 is made really pivotable at this alignment. The gap between the slots 11 and 12 of a fixed electrode 13 and the duplex cylinder electrode 16 and the gap between the substrate 17 of the duplex cylinder electrode 16 and the right end plate 3 of a container 1 are filled up with the electroviscous fluid 18.
[0015] The seal of the electroviscous fluid 18 with which it filled up is carried out with O ring 19 which intervened between the fixed electrode 13 and the Rota shaft 4, and the plug (lock out member) 20 which blockades opening 3a formed in the right end plate 3 of a container 1, and, thereby, the electroviscous fluid 18 is filled up with the sealing condition to the limit in the container 1. The Rota shaft 4 in and the condition of rotating to the duplex cylinder electrode 16 and one By impressing an electrical potential difference to the electroviscous fluid 18 in a container 1 from the electrode terminal 22 for low batteries which is attached in the electrode terminal 21 for high voltages and the outer-ring-of-spiral-wound-gasket presser foot 8 which are attached in the peripheral wall of a container 1 and flow in a fixed electrode 13, and flows in the duplex cylinder electrode 16 through bearing 5 and the Rota shaft 4 The viscosity of this electroviscous fluid 18 changes and damping force is given to the duplex cylinder electrode 16, as a result the Rota shaft 4.
[0016] Here, with the gestalt of this operation, the plug 20 which blockades opening 3a of the right end plate 3 of a container 1 is attached in shaft orientations movable along with the guide pin 23 prepared in the right end plate 3. The guide pin 23 is attached in the check plate 24 attached in the right end plate 3 from the outside, and this check plate 24 regulates the migration beyond the need for the method of the outside of shaft orientations of a plug 20. Moreover, the plug 20 is equipped with O ring (rubber or elastomer) 25, therefore a plug 20 touches the inner circle wall of opening 3a through O ring 25.
[0017] Thus, since the plug 20 which blockades opening 3a of the right end plate 3 of a container 1 is attached in shaft orientations movable with the gestalt of this operation According to the volume change of the electroviscous fluid 18 in the container 1 by the surrounding temperature change, a plug 4 moves to shaft orientations. An electroviscous fluid 18 begins to leak outside from O ring 25 with which could adjust the internal pressure in a container 1 automatically, consequently O ring 19 and plug 20 between a fixed electrode 13 and the Rota shaft 4 were equipped, or Or it can prevent that the open air invades in a container 1, and the brake gear which is stabilized for a long period of time, and operates can be offered.
[0018] In addition, although the brake gear which used the electroviscous fluid was taken for the example as a liquid restoration well-closed container with the gestalt of the above-mentioned implementation, it is not limited to this but, of course, this invention may be applied to other liquid restoration well-closed containers. Moreover, although the case where a plug 20 was equipped with O ring 25 was taken for the example with the gestalt of the above-mentioned implementation As long as it is not necessary to necessarily do in this way and the seal nature between the inner circle walls of opening 3a can be secured, a metal, Only the plug formed with resin, the ceramics, etc. may be used, and the configuration of a plug can also be used as a multiple column, a cylinder, etc. in accordance with the configuration of opening 3a, and it is also still more possible to use a screw, a ball, etc. However, the direction where it was made for a plug to touch through the inner circle wall, the rubber, or the elastomer of opening 3a is desirable at the point of securing migration of the plug by the pressure variation in seal nature and a container 1, and, as for the rubber or the elastomer which intervenes between a plug and the inner circle wall of opening, it is more desirable to use a ring-like thing like the gestalt of the above-mentioned implementation. In addition, ring-like rubber or an elastomer can adjust the area which touches the inner circle wall of opening by the path or the number to install of ring-like rubber or an elastomer according to the degree of change of the cubical expansion and contraction of the liquid with which it fills up into a container 1.
[0019] Furthermore, when the attachment section of a plug is a thin wall, the cylinder-like extension section 30 is formed in a thin wall, and you may make it attach a plug 20 movable in this extension section 30 at shaft orientations, as shown in drawing 2 although the case where a plug 20 was attached in the comparatively heavy-gage end plate 3 was taken for the example with the gestalt of the above-mentioned implementation. In addition, drawing 2 shows the example equipped with two O rings 25 to the plug 20.
[0020] Furthermore, although the plug was taken for the example as a lock out member, it replaces with this and you may make it seal opening 3a of a container with the gestalt of the above-mentioned implementation using lids, such as diaphram made from an elastomer. The example of attachment of the

diaphram 41 in the case of the wall of thin meat is comparatively shown for the example of attachment of the diaphram 40 in the case of a comparatively heavy-gage wall in drawing 3 at drawing 4 . It is desirable to attach diaphrams 40 and 41 using stops 42 and 43 in any case. It is more desirable from the field of sealing nature to be the same ingredient as a well-closed container, although especially a limit does not have the ingredient of stops 42 and 43.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is an explanatory sectional view for explaining the brake gear using the electroviscous fluid which is an example of the gestalt of operation of this invention.
[Drawing 2] It is the sectional view showing the modification of the attachment section of a plug.
[Drawing 3] It is the sectional view showing the example of attachment of diaphram.
[Drawing 4] It is the sectional view showing the modification of the attachment section of diaphram.
[Description of Notations]
1 -- Container
2 -- Left end plate
3 -- Right end plate
3a -- Opening
4 -- Rota shaft
5 6 -- Bearing
11 12 -- Duplex cylinder-like slot
13 -- Fixed electrode
16 -- Duplex cylinder electrode (body of revolution)
18 -- Electroviscous fluid
19 -- O ring
20 -- Plug (lock out member)
21 -- Electrode terminal for high voltages
22 -- Electrode terminal for low batteries
23 -- Guide pin
24 -- Check plate
25 -- O ring (rubber or elastomer)

[Translation done.]

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15/52		15/52	Ｚ	

審査請求　未請求　請求項の数９　ＯＬ　（全４頁）

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(71)出願人　000000033
旭化成株式会社
大阪府大阪市北区堂島浜１丁目２番６号
(72)発明者　井上　昭夫
静岡県富士市鮫島２番地の１　旭化成工業株式会社内
(72)発明者　西村　昭二
静岡県富士市鮫島２番地の１　旭エンジニアリング株式会社内
(74)代理人　100066980
弁理士　森　哲也　（外２名）

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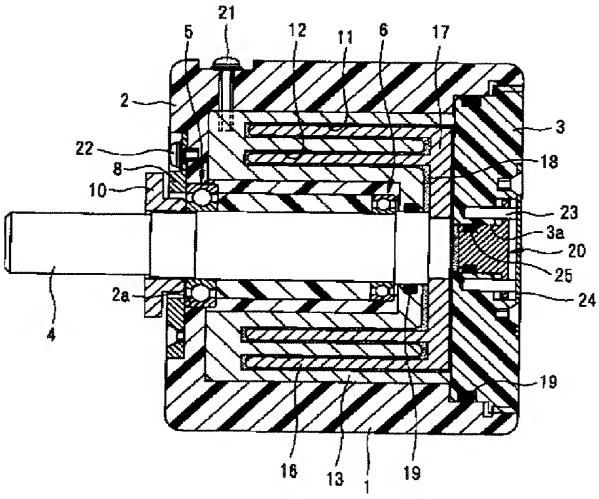
GB12 HA04 HB04 HC03 HD04
3J043 AA12 CA01 DA03 FA03 FB20

(54)【発明の名称】　液体充填密閉容器

(57)【要約】
【課題】　充填された液体の密閉部分からの漏れ及び内部への外気の侵入の両方を防止する。
【解決手段】　液体１８が内部に充填されると共に開口部３ａが栓２０で密閉された液体充填密閉容器１において、栓２０を容器１内の内圧の変化に応じて軸方向に移動可能に構成する。



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【特許請求の範囲】

【請求項１】　液体が内部に充填されると共に開口部が閉塞部材で密閉された液体充填密閉容器において、前記閉塞部材を内圧の変化に応じて変位可能に構成したことを特徴とする液体充填密閉容器。

【請求項２】　前記閉塞部材が変形可能な蓋であることを特徴とする請求項１に記載の液体充填密閉容器。

【請求項３】　前記蓋がダイヤフラムであることを特徴とする請求項２に記載の液体充填密閉容器。

【請求項４】　前記閉塞部材が開口部の開口壁に沿って移動可能な栓であることを特徴とする請求項１記載の液体充填密閉容器。

【請求項５】　前記栓が前記開口壁とゴムまたはエラストマーを介して接することを特徴とする請求項４記載の液体充填密閉容器。

【請求項６】　充填された液体が空気と接しないことを特徴とする請求項１～５のいずれか一項に記載の液体充填密閉容器。

【請求項７】　前記液体として、外部刺激により粘性が変化する機能性流体を用いたことを特徴とする請求項１～６のいずれか一項に記載の液体充填密閉容器。

【請求項８】　前記外部刺激が電場及び／又は磁場の印加であることを特徴とする請求項７記載の液体充填密閉容器。

【請求項９】　前記機能性流体の粘性変化を利用して内部に配置された回転体に制動力を付与することを特徴とする請求項７又は８記載の液体充填密閉容器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、液体が内部に充填されると共に開口部が閉塞部材で密閉された液体充填密閉容器に関する。

【０００２】

【従来の技術】比較的剛性のある密閉容器に液体を一杯に充填した場合、充填された液体と密閉容器の材料との体積膨張率が異なると、周囲の温度変化によって液体の体積膨張量が容器の体積膨張量を上回って容器内の内圧が上昇して液体が密閉部分から漏れ出したり、或いは液体の体積収縮量が容器の体積収縮量を上回って容器の内圧が減少して該容器内に外気を引き込んでしまう等の問題が生じる。

【０００３】このような事情から、従来においては、通常、密閉容器内に圧縮性のある空気（気体）溜まりを残して液体を充填したり、密閉容器の素材に比較的伸びやすい材料を用いたり、或いは密閉容器に内圧調整用の別の容器を連結したりする等の対策を施している。

【０００４】

【発明が解決しようとする課題】しかしながら、容器内に空気溜まりを残して液体を充填する場合は、空気（気体）と接触すると性能が劣化したり、固化したりする液体には不向きである。このような液体の具体例としては主に電気材料として使用される液体が挙げられ、容器内に空気が混入すると絶縁破壊や電極腐食を起こしやすくなる。特に、電気粘性流体を用いたクラッチやブレーキの場合は、電気粘性流体が正負の電極が設けられた密閉容器内に収められているため、容器内に空気が混入した状態で各電極間に電圧を印加すると、容易に絶縁破壊を生じてしまう。

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【０００５】また、密閉容器の素材として伸びやすい材料を用いた場合は、精密な寸法精度が要求されたり、変形が嫌われる密閉容器には不向きであり、更には、密閉容器に内圧調整用の容器を別途に連結する場合は、容器全体の占めるスペースが大きくなるという問題が発生する。本発明はこのような不都合を解消するためになされたものであり、周囲の温度変化に対して、充填された液体の密閉部分からの漏れ及び内部への外気の侵入の両方を防止することができる液体充填密閉容器を提供することを目的とする。

【０００６】

【課題を解決するための手段】上記目的を達成するために、請求項１に係る液体充填密閉容器は、液体が内部に充填されると共に開口部が閉塞部材で密閉された液体充填密閉容器において、前記閉塞部材を内圧の変化に応じて変位可能に構成したことを特徴とする。請求項２に係る液体充填密閉容器は、請求項１において、前記閉塞部材が変形可能な蓋であることを特徴とする。

【０００７】請求項３に係る液体充填密閉容器は、請求項２において、前記蓋がダイアフラムであることを特徴とする。請求項４に係る液体充填密閉容器は、請求項１において、前記閉塞部材が開口部の開口壁に沿って移動可能な栓であることを特徴とする。請求項５に係る液体充填密閉容器は、請求項４において、前記栓が前記開口壁とゴムまたはエラストマーを介して接することを特徴とする。

【０００８】請求項６に係る液体充填密閉容器は、請求項１～５のいずれか一項において、充填された液体が空気と接しないことを特徴とする。請求項７に係る液体充填密閉容器は、請求項１～６のいずれか一項において、前記液体として、外部刺激により粘性が変化する機能性流体を用いたことを特徴とする。

【０００９】請求項８に係る液体充填密閉容器は、請求項７において、前記外部刺激が電場及び／又は磁場の印加であることを特徴とする。請求項９に係る液体充填密閉容器は、請求項７又は８において、前記機能性流体の粘性変化を利用して内部に配置された回転体に制動力を付与することを特徴とする。

【００１０】ここで、液体充填密閉容器は、例えば体積膨張率が5×10^{-5}以下で引っ張り伸度数が１％／ｋｇ／ｃｍ$^{-2}$以下の剛直で伸びの少ない材料が用いられ、具体的には、金属、樹脂、セラミックス等あるいはこれら

の複合体が挙げられる。液体は、自由に流動する水や油等の他に、外力をかけないと流動しないグリースやクリーム状のものを用いることができる。

【００１１】閉塞部材は、充填された液体の体積変化に応じて変化する密閉容器の内圧を調整する手段であり、液漏れ及び外気侵入を防止する役割を果たす。蓋としては、例えばフレキシブルで変形可能なダイアフラム、シート、蛇腹等を用いることが可能である。機能性流体とは、レオロジー的特性、例えば粘性や弾性が電場や磁場等の外部刺激により大きく変化し、その変化が瞬間的でかつ可逆的であるものをいい、例えば、電場により変化する電気粘性流体（ＥＲ流体）、磁場により変化する磁気粘性流体（ＭＲ流体）、電場にも磁場にも応答して変化する電気磁気粘性流体（ＥＭＲ流体）等が挙げられる。

【００１２】

【発明の実施の形態】以下、本発明の実施の形態の一例を図を参照して説明する。図１は本発明の実施の形態の一例である電気粘性流体を用いたブレーキ装置を説明するための説明的断面図、図２は栓の取付部の変形例を示す断面図、図３及び図４はダイヤフラムの取付例を示す断面図である。

【００１３】図１において符号１は両端部（左右端部）にそれぞれ樹脂製端板２，３を有する円筒状の樹脂製容器であり、該容器１内にはロータシャフト４が二個の金属製軸受５，６を介して回転可能に支持されている。図において左側の大きめの軸受５は左端板２のシャフト貫通孔２ａに取り付けられ、外輪が左端板２にネジ止めされた外輪押え８によって軸方向に押され、内輪がシャフト４に螺合された内輪押え１０によって軸方向に押されている。

【００１４】また、容器１内には二重円筒状の溝１１，１２を有する金属製の固定電極１３が内蔵され、ロータシャフト４には固定電極１３の溝１１，１２に所定の間隙を介して挿入される金属製の二重円筒電極（回転体）１６が同心に嵌合固定されて一体回転可能とされている。固定電極１３の溝１１，１２と二重円筒電極１６との間の間隙、及び二重円筒電極１６の基板１７と容器１の右端板３との間の間隙には電気粘性流体１８が充填されている。

【００１５】充填された電気粘性流体１８は固定電極１３とロータシャフト４との間に介在されたＯリング１９と容器１の右端板３に形成された開口部３ａを閉塞する栓（閉塞部材）２０によってシールされており、これにより、電気粘性流体１８が容器１内に密閉状態で一杯に充填されている。そして、ロータシャフト４が二重円筒電極１６と一体に回転している状態で、容器１の外周壁に取り付けられて固定電極１３に導通する高電圧用電極端子２１及び外輪押さえ８に取り付けられて軸受５、ロータシャフト４を介して二重円筒電極１６に導通する低電圧用電極端子２２から容器１内の電気粘性流体１８に電圧を印加することにより、該電気粘性流体１８の粘性が変化し、二重円筒電極１６ひいてはロータシャフト４に制動力が付与されるようになっている。

【００１６】ここで、この実施の形態では、容器１の右端板３の開口部３ａを閉塞する栓２０を、右端板３に設けたガイドピン２３に沿って軸方向に移動可能に取り付けている。ガイドピン２３は右端板３に外側から取り付けられた止め板２４に取り付けられており、この止め板２４は栓２０の軸方向外方への必要以上の移動を規制するようになっている。また、栓２０にはＯリング（ゴムまたはエラストマー）２５が装着されており、従って、栓２０はＯリング２５を介して開口部３ａの内周壁に接するようになっている。

【００１７】このようにこの実施の形態では、容器１の右端板３の開口部３ａを閉塞する栓２０を軸方向に移動可能に取り付けているので、周囲の温度変化による容器１内の電気粘性流体１８の体積変化に応じて栓４が軸方向に移動して、容器１内の内圧を自動的に調整することができ、この結果、固定電極１３とロータシャフト４との間のＯリング１９や栓２０に装着されたＯリング２５から電気粘性流体１８が外部に漏れ出したり、或いは容器１内に外気が侵入するのを防止することができ、長期間安定して作動するブレーキ装置を提供することができる。

【００１８】なお、上記実施の形態では、液体充填密閉容器として、電気粘性流体を用いたブレーキ装置を例に採ったが、これに限定されず、他の液体充填密閉容器に本発明を適用してもよいのは勿論である。また、上記実施の形態では、栓２０にＯリング２５を装着した場合を例に採ったが、必ずしもこのようにする必要はなく、開口部３ａの内周壁との間のシール性を確保できる限りにおいて金属、樹脂、セラミックス等で形成された栓のみを用いても良く、また、栓の形状も開口部３ａの形状にあわせて多角柱、円柱等とすることができ、更には、ネジやボール等を用いることも可能である。但し、栓が開口部３ａの内周壁とゴムまたはエラストマーを介して接するようにした方が、シール性及び容器１内の圧力変化による栓の移動を確保する点で好ましく、また、栓と開口部の内周壁との間に介在されるゴムまたはエラストマーは、上記実施の形態のようにリング状のものを用いることがより好ましい。なお、リング状のゴムまたはエラストマーは、容器１中に充填される液体の体積膨張・収縮の変化の度合いに応じて、開口部の内周壁と接する面積をリング状のゴムまたはエラストマーの径あるいは設置する個数によって調整することができる。

【００１９】更に、上記実施の形態では、比較的厚肉の端板３に栓２０を取り付けた場合を例に採ったが、栓の取付部が薄肉壁の場合は、図２に示すように、薄肉壁に円筒状の延出部３０を設けて、該延出部３０内に栓２０

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を軸方向に移動可能に取り付けるようにしてもよい。なお、図２では栓２０に二個のＯリング２５を装着した例を示している。

【００２０】更に、上記実施の形態では、閉塞部材として栓を例に採ったが、これに代えて、エラストマー製のダイヤフラム等の蓋を用いて容器の開口部３ａを密閉するようにしてもよい。図３に比較的厚肉の壁の場合のダイヤフラム４０の取付例を、図４に比較的薄肉の壁の場合のダイヤフラム４１の取付例を示す。いずれの場合もダイヤフラム４０，４１を止め具４２，４３を用いて取り付けるのが好ましい。止め具４２，４３の材料は特に制限はないが密閉容器と同じ材料であるほうが密閉性の面から好ましい。

【００２１】

【発明の効果】上記の説明から明らかなように、本発明によれば、周囲の温度変化に対して、充填された液体の密閉部分からの漏れ及び内部への外気の侵入の両方を防止することができるという効果が得られる。

【図面の簡単な説明】

【図１】図１は本発明の実施の形態の一例である電気粘性流体を用いたブレーキ装置を説明するための説明的断面図である。

＊【図２】栓の取付部の変形例を示す断面図である。

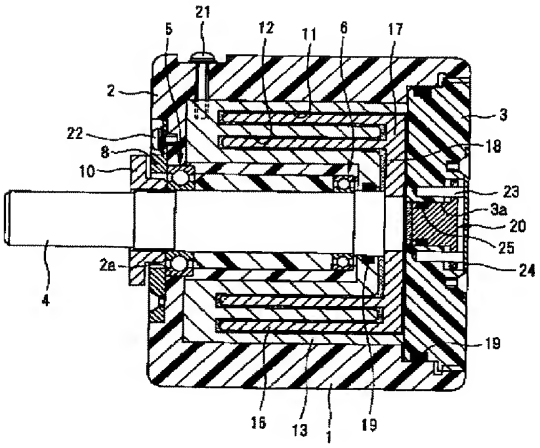
【図３】ダイヤフラムの取付例を示す断面図である。

【図４】ダイヤフラムの取付部の変形例を示す断面図である。

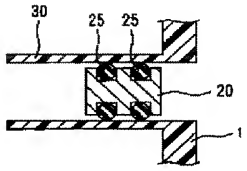
【符号の説明】

１…容器
２…左端板
３…右端板
３ａ…開口部
４…ロータシャフト
５，６…軸受
１１，１２…二重円筒状の溝
１３…固定電極
１６…二重円筒電極（回転体）
１８…電気粘性流体
１９…Ｏリング
２０…栓（閉塞部材）
２１…高電圧用電極端子
２２…低電圧用電極端子
２３…ガイドピン
２４…止め板
２５…Ｏリング（ゴムまたはエラストマー）

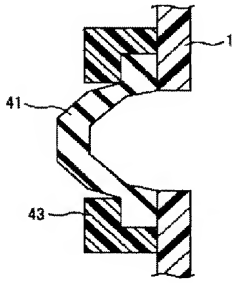
【図１】



【図２】



【図４】



【図３】